

# Lignin Separation and Epoxide-Lignin Manufacturing



## Lignin-Derived Resins Recovered from Mill Process Waste Find 20 New Uses with More on the Way

Inventor Ken Kurple received a grant from the Department of Energy's Inventions and Innovation Program to perfect a patent for extracting lignin from black liquor (paper mill waste) by lowering the pH (alkalinity) of the black liquor and making the lignin insoluble. After filtering out the lignin, the process removes impurities and adds special ingredients to create a manufacturing resin from what had been unrecoverable waste. Before lignin recovery was perfected, industry was incinerating approximately 16 million tons of black liquor annually. A replacement product for petroleum, the new resin is now used in products such as a traction-enhancing tire spray, foams, adhesives, and foundry resins.

A primary industrial application for Lenox Polymers is the production of foundry castings for automotive transmission housings, steam pipe fittings, air motor castings, and governor housings. Recently, Lenox signed a marketing, development, and supply agreement with PPG Industries to develop specific lignin products for the automotive market.

### Benefits

#### Employee Health

Products produced with this technology have important environmental advantages that can reduce employee exposure to formaldehyde in some applications.

#### Product Quality

Proven success in producing foundry castings and as a product-enhancing material in a variety of adhesives, plastic, and automotive products.

#### Profitability

By substituting a renewable, environmentally friendly resource for petroleum-derived resins, this technology saves petroleum for higher-value uses. Produces a lower-cost manufacturing resin with improved performance.

#### Waste Reduction

Lignin extraction lowers disposal costs for pulp mills and reduces the amount of black liquor burned, cutting air emissions and lowering costs to comply with environmental laws and air emission ceilings.

### Overview

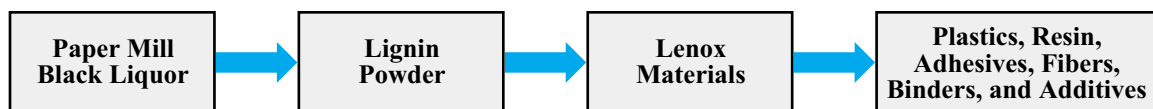
- ◆ Lenox Polymers has established licensing or partnership agreements with companies in Germany, Japan, and the United States since 1994
- ◆ Lignin-derived resins received a Michigan Technology Award
- ◆ A unit in Port Huron, Michigan has been modifying lignin for commercial use since 1992

### Applications

- ◆ Resource recovery in pulp and paper industry
- ◆ Resins for the automotive, foundry, plastics, construction, military, furniture, marine, and agricultural industries

### Capabilities

- ◆ Able to treat black liquor from pulp mills to extract lignin, which is filtered and modified to create manufacturing resins that substitute for urea-formaldehyde, polyester phenolic, and polyurethane resins.
- ◆ Resins can withstand high temperatures and are flame resistant and formaldehyde-free.



*Lignin Separation and Epoxide-Lignin Manufacturing*